

of Unemployment in Croatia*

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Abstract

This paper analyzes regional labor market differences in Croatia. The unemployment rates are identified for five Croatian regions, which are formed according to the NUTS II introduction proposal. Differences between regional and national unemployment dynamics are investigated by applying seemingly unrelated regression methods. The results indicate that Croatian regions can be divided into three groups, with Central Croatia having the strongest correlation with developments at the national level.

Keywords: regional unemployment, regression analysis, seemingly unrelated regression equations, Croatia.

JEL classification: R23, J64

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1 Introduction

The issue of relatively high unemployment rates has frequently been addressed in the analysis of the Croatian economy. Nonetheless, numerous questions relating to the labor market have not been sufficiently explored empirically. The issue of scarce empirical analysis is even more pronounced at a regional level.

What makes the study of regional labor market differences so interesting is the context of the European economic integration. According to theory, a country decides to enter a monetary union after having met the following conditions:

- a) external influences on total demand and supply in countries participating in the union should be symmetrical,
- b) the mobility of the labor force should be higher within the member countries,
- c) real wages should be flexible.¹

Conditions for a successful integration are obviously related to the labor market. One of the guiding principles of the overall integration process declares that the introduction of a common market will contribute to an increased mobility not only of capital, to which the state borders have already ceased to present an obstacle, but also of the labor force. An increased mobility will contribute to a more efficient allocation of resources through market competition. However, the answer to the question whether such theoretical predictions can be proven in practice is far from unequivocal. Research indicates that there are regions in some countries which have, over longer periods, achieved inferior results in the labor market relative to the national average. If the mobility of production factors is not ensured at the national level, the mobility cannot be expected to increase simply thanks to the influence of wider integration processes. Thus actual benefits of the integration may be far less significant than expected.

Empirical research indicates that differences among EU regions are much more profound than among individual member states.² Therefore, an interesting question arises as to whether further divergence between the regions may occur as a consequence of the integration process since some regions, as opposed to others, may benefit more

¹ See, for example, Bertola, Boeri and Nicoletti (2001, p. 210).

² Amendola, Cavoleo and Coppola (2003).

from the process itself. In this context regional differences in Croatia need to be compared with the movements in other EU candidate countries. Current empirical research indicates that the differences between regional labor markets of candidate countries increase during the transition period and approximate those of Western Europe.³ The question is whether such differences will keep growing or whether the trend will reverse. Long-lasting divergent movements (conditional or unconditional) are incompatible with theoretical models, particularly with neoclassical growth models. However, labor market models, while predicting a gradual disappearance of regional differences, monitor the restoring of balance speed. According to the latter models, the rate at which the labor market restores its balance is commensurate to the labor market flexibility; flexibility is assessed through labor force mobility and the possibility of wage adjustments to market conditions. The requirement for increased flexibility in the labor market, often quoted in public, arises directly from these theoretical models.

The experience of other transition countries, in particular of the EU candidate countries, is also relevant to Croatia. However, a comparison of the Croatian labor market relative to other countries cannot be carried out without identifying certain specifics or peculiarities. One of these peculiarities that affect the labor market in Croatia is the recent war experience. The impact of the war itself is a sufficient reason to test whether the results of other studies could be deemed relevant in Croatian case.

The following section presents a theoretical model, which addresses the issue of regional differences in the labor market and specifies the segment of the theoretical framework discussed in the paper. The third section discusses the regional data availability issue in Croatia, and its implications with regard to the interpretation of the results. The results of empirical research and their interpretation are outlined in the fourth section while the fifth and last section is a conclusion.

2 Theoretical Framework

Regional aspects of the labor market are frequently observed in the literature within a model articulated by Blanchard and Katz (1992). The model incorporates developments regarding employment, unemployment, activity and wage rates in

³ *Gacs and Huber (2003).*

individual regions, and interprets their interrelationship in a given region. The basic idea behind the models is presented next. According to this model, employment movement in a specific region may be illustrated by the following equation:⁴

$$(1) \quad l_{R,t} = z_{R,t} - \alpha w_{R,t}$$

where $l_{R,t}$ stands for employment in the region R over the time period t ; $w_{R,t}$ stands for wages in the region R over the time period t ; while z is the parameter explaining shifts in the labor demand curve. In other words, employment depends upon a specific position on the labor demand curve (the z parameter primarily involves capital mobility) as well as upon wages. All the model variables have been expressed in logarithmic differences from the national average, because the model aims to explain why some regions exhibit better indicators relative to the national average, and to project movements of such differences in time.

The decision of an entrepreneur on the location of a new facility depends primarily on costs, therefore on the difference between the wage rates in a region relative to the national average:

$$(2) \quad \Delta z_{R,t} = \rho_{0,i} - \rho_1 w_{R,t} + \zeta_{R,t}$$

Labor supply in a region depends on demographic factors, and on decisions regarding participation in the labor market. Labor supply may, therefore, be expressed as follows:

$$(3) \quad n_{R,t} = pop_{R,t} + p_{R,t}$$

where $n_{R,t}$ stands for the labor force supply in the region R over the time period t ; $p_{R,t}$ is the activity rate in the region R over the time period t ; while $pop_{R,t}$ shows the movement of the population in the region R over the time period t . The unemployment rate and the wage level affect activity rates, hence:

$$(4) \quad p_{R,t} = \lambda_0 + \lambda_1 u_{R,t} + \lambda_2 w_{R,t} + \zeta_{R,t}$$

where $u_{R,t}$ stands for the unemployment rate in the region R over the time period t . Demographic factors may be modeled in line with a migration theory, which assumes that the population migrates from a region with a relatively low wage rate and high unemployment to regions with a relatively high wage rate and lower unemployment, thus:

⁴ The short presentation of the model has also been used by Gacs and Huber (2003).

Research methods applied in distinguishing between national movements and specific regional ones are different, thus often providing different results. Therefore, this makes the interpretation of the data obtained in such a way even more difficult. The empirical analysis applied in this work has followed the approach used by Shepherd and Dixon (2002). They proved that the method of seemingly unrelated regressions (SUR) results in more reliable estimates than the traditional OLS method.

The process of region defining in Croatia is not completed. While some regions can intuitively be marked off according to economic or other criteria, it is clear that this is a multi-criterion division which necessarily implies a number of solutions. At the same time the current territorial organization, division into 21 counties, is inadequate for the requirements of economic analysis for two main reasons:

- The first reason relates to the fact that the current territorial organization has been in force for a relatively short time and that relating data to the previous territorial organization is hardly possible. As the analysis can be carried out for a relatively short time-period, a question arises as to the number of degrees of freedom to be assigned to regression.
- Another reason relates to the fact that the objective of the results obtained by regional analysis is often the creation of economic policy measures aimed at resolving problems occurring in a given area. However, considering the number of counties in Croatia, imposing specific economic policy measures and then monitoring their effects would require considerable efforts in developing specific criteria and gathering the relevant data in such a large number of units.

It follows that existing territorial units need to be aggregated in appropriate regions. As it is not the objective of this analysis to define meaningful economic regions in Croatia, a pragmatic solution is to apply the proposal developed by a task group of the Central Bureau of Statistics for the purpose of introducing a system of NUTS.⁵ The introduction of this system complies with Eurostat guidelines, which divides the EU area according to the same principle into 78 NUTS level 1 regions and 211 NUTS level

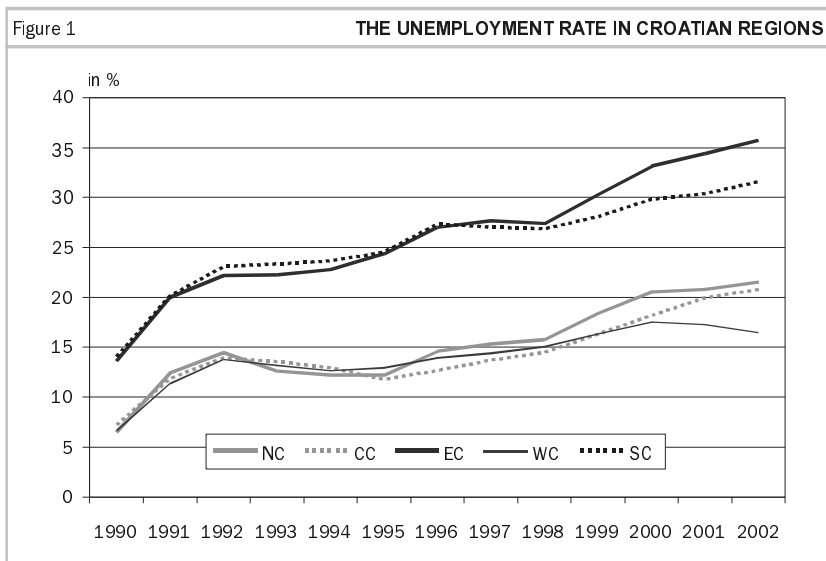
⁵ *The Nomenclature of Territorial Units for Statistics (NUTS). It needs to be noted that at the time this paper was prepared, a proposal for the division of Croatia into five regions for statistical purposes had not yet been officially adopted.*

2 regions.⁶ As according to the NUTS nomenclature, the entire territory of the Republic of Croatia is just one NUTS level 1 region, for the purpose of analysis the NUTS level 2 has been applied. Subsequently, the Republic of Croatia has been subdivided into 5 regions:

- Northern Croatia (NC), which covers the following counties: Krapinsko-Zagorska, Varaždinska, Koprivničko-Križevačka and Međimurska;
- Central Croatia (CC), which covers the following counties: Zagrebačka, Sisačko-Moslavačka, Karlovačka, Bjelovarsko-Bilogorska and the City of Zagreb;
- Eastern Croatia (EC), which covers the following counties: Virovitičko-Podravska, Požeško-Slavonska, Brodsko-Posavska, Osječko-Baranjska and Vukovarsko-Srijemska;
- Western Croatia (WC), which covers the following counties: Primorsko-Goranska, Ličko-Senjska and Istarska;
- Southern Croatia (SC), which covers the following counties: Zadarska, Šibensko-Kninska, Šplitsko-Dalmatinska and Dubrovačko-Neretvanska.

For the regions thus defined, the unemployment rates have been calculated according to available data sources. The unemployment rate has been calculated as the ratio of the number of unemployed according to the Croatian Employment Service data to the total sum of both the employed and unemployed. The source for the number of employed by counties is the Central Bureau of Statistics, and the data includes the total employed by legal entities, trades and crafts, and free professionals. This data is available only at the annual level, and presents another limitation to a potential analysis at the regional level. In view of the above territorial division, Figure 1 clearly shows differences between unemployment rates in individual regions. However, one might also presume that the path of unemployment is influenced by countrywide factors, while the level of unemployment is determined by the regional factors.

⁶ *Eurostat (1999).*



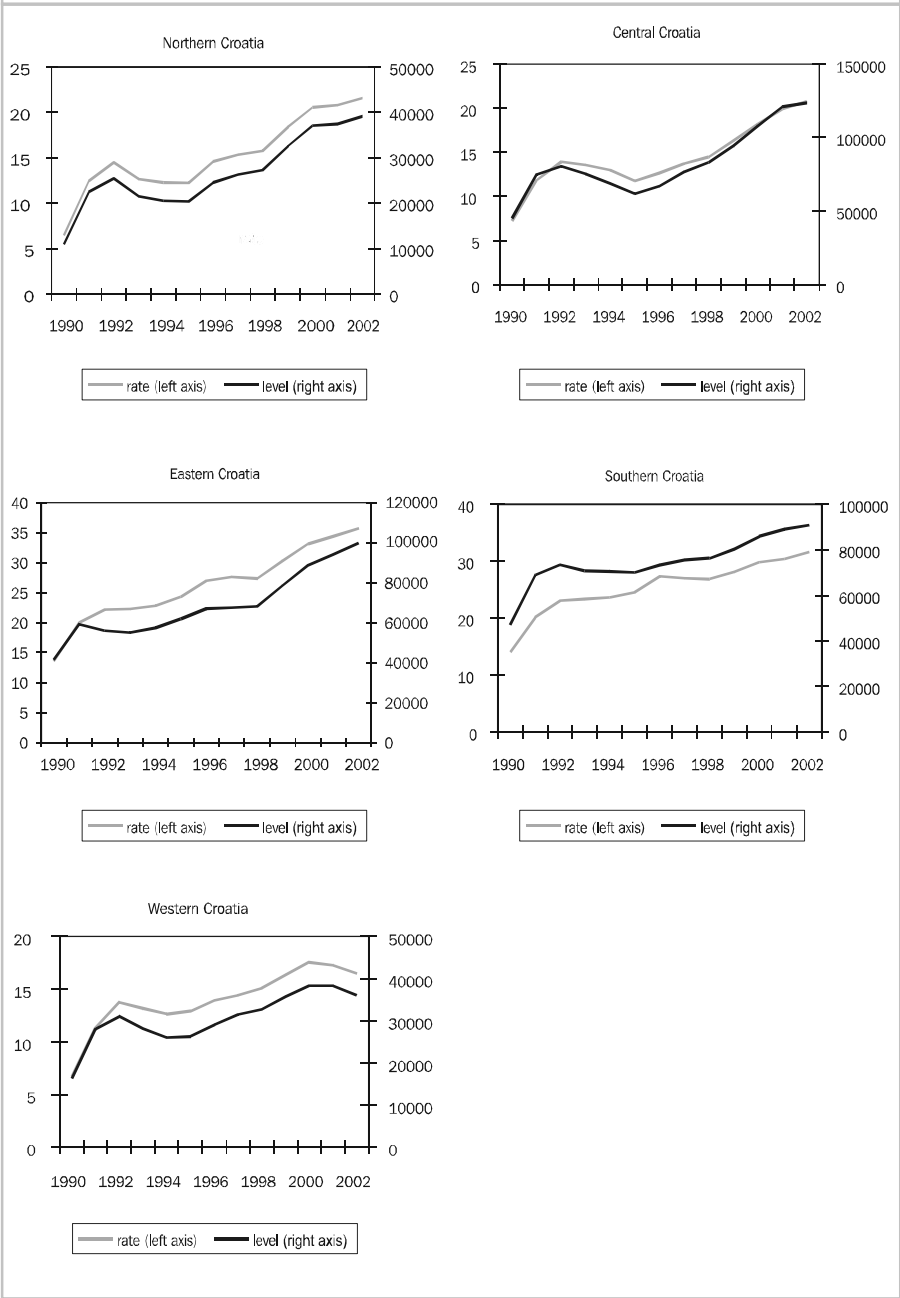
Notes: NC - Northern Croatia, CC - Central Croatia, EC - Eastern Croatia, WC - Western Croatia, SC - Southern Croatia.
 Sources: Central Bureau of Statistics and Croatian Employment Service.

Since employment data is available according to the organizational principle rather than the core activity principle, its regional distribution does not match the actual regional distribution of economic activities.⁷ Therefore the unemployment rates presented in Figure 1 should be taken only as indicative and not as exact data. Nonetheless, in order to enable the application of a selected model, regression analysis in the remaining part of the paper uses the regional unemployment level instead of the regional unemployment rates data. An indicator of differences in regional unemployment rates, as a relative measure of unemployment, is much more suitable for analysis than the unemployment level in individual regions. In order to test whether it is possible to use unemployment levels instead of unemployment rates, a correlation analysis for unemployment rates and levels in a region has been conducted. The results indicate that a correlation coefficient for Northern Croatia is close to 1; for Central Croatia it is 0.98; for Eastern Croatia 0.97; for Western Croatia 0.98 and for Southern Croatia 0.96. All correlation coefficients are significant at the level of 5 percent. Unemployment rates and unemployment levels in individual regions are presented in Figure 2.

⁷ According to the organizational principle, when entrepreneur's headquarter is located in one region all his/her employees will be statistically recorded as working in this region.

Figure 2

UNEMPLOYMENT LEVELS AND RATES IN CROATIAN REGIONS



Source: Central Bureau of Statistics and Croatian Employment Service.

The application of a model by applying unemployment levels instead of unemployment rates is not commonly used in the literature. The unemployment rate is affected by both economic and demographic factors, such as changes in the number of inhabitants or migrations. While the analyzed period is relatively short for recording significant demographic changes, significant migrations due to war were witnessed in Croatia during the analyzed period. It might reasonably be expected that such significant migrations would affect the correlation between the rate and the level of unemployment. In spite of the migrations, the analyzed period was short enough to enable the switch between rates and level data. Analyses for longer periods would require the data on unemployment rates.

The analysis was carried out on the basis of monthly data within the January 1990 - December 2002 timeframe. Although there might be some interpretation problems with seasonally adjusted data regressions, there are significant differences between seasonal movements in the regional labor market in Croatia. Therefore, it seemed justifiable to use the seasonally adjusted data for the analysis purposes. Regional and overall unemployment level data series were seasonally adjusted separately, prior to the regression analysis.

4 Main Results

The general idea was to estimate the part of the model that deals with unemployment behavior. The first step towards this goal was to investigate the behavior of regional unemployment data series in Croatia. Before the regression was specified, all of the series were tested for the presence of the unit root. One of the reasons for this is that previous studies indicated that economic data series often prove to be non-stationary. If non-stationary series are used in regression analysis, results might be biased. In addition, statistical tests used to assess the applied model may in such cases be less powerful. It is worth noting that while the presence of a unit root was previously established for the national unemployment level data, regional unemployment data has not been examined in Croatia to date.⁸ Table 1 presents the results of the Dickey-Fuller test on the presence of the unit root.⁹

⁸ *Erjavec, Cota and Babovec (1999) report the presence of a unit root in the national unemployment series for the period 1992:1 to 1998:12.*

⁹ *Botrić (2003) presents the results of the Phillips-Perron test, which confirm the results obtained in this paper.*

ADF UNIT ROOT TEST FOR THE UNEMPLOYMENT DATA SERIES					
Table 1	Series	Intercept and trend excluded		Intercept	
		DF	ADF(4)	DF	ADF(4)
				Intercept and trend	
	CT	3.87	0.24	-2.69*	-1.44
	NC	2.92	0.06	-2.21	-1.25
	CC	3.92	-0.19	-1.79	-1.03
	EC	3.54	1.18	-0.66	-1.24
	WC	1.50	0.09	-3.52***	-0.62
	SC	2.97	0.79	-4.43***	-3.37*
	CT	-4.67***	-2.47**	-4.87***	-2.59
	NC	-5.68***	-2.56**	-5.90***	-2.62*
	CC	-4.89***	-2.32**	-5.17***	-2.35
	EC	-7.88***	-3.11***	-8.32***	-3.49***
	WC	-5.71***	-2.86***	-5.76***	-2.88**
	SC	-7.58***	-3.25***	-7.89***	-3.46**

Notes: Not being able to reject the unit root hypothesis at the level of significance of *** 1 percent, ** 5 percent and * 10 percent.
 NC - Northern Croatia, CC - Central Croatia, EC - Eastern Croatia, WC - Western Croatia, SC - Southern Croatia, CT - Croatia total.
 Source: Author's calculations.

The results presented in Table 1 indicate that all the data series follow the $I(1)$ process. This means that the transformation of the original regional data series by using first differences in the model is sufficient to obtain stationary series.

Dependent variable	Independent variable				
	<i>CT</i>	<i>NC</i>	<i>CC</i>	<i>EC</i>	<i>WC</i>
<i>CT</i>	-				
<i>NC</i>	-2.88	-			
<i>CC</i>	-2.04	-2.24	-		
<i>IEC</i>	-1.69	-1.94	-1.83	-	
<i>WC</i>	-0.48	-0.94	-1.31	-1.49	-
<i>SC</i>	-2.69	-2.84	-2.75	-2.79	0.19

As the results indicate that there is no cointegration between regional unemployment data and the series follows the $I(1)$ process, the first differences of the unemployment series were used in regression.

to organize the regions in such a way that they are equally represented in the structure of the overall economy. Unfortunately, this criterion is not applied when defining regions in other countries either, hence this problem persists in regional analyses.

The results obtained by using the SUR method are presented in Table 3.¹⁰

THE SUR ESTIMATES RESULTS							
Dependent variables	Independent variables					R ²	DW
	ΔNO	ΔCC	ΔEC	ΔWC	ΔSC		
ΔNC	-	0.18* (5.08)	0.10* (2.81)	0.29* (3.77)	-0.01 (-0.13)	0.46	1.77
ΔCC	0.72* (5.08)	-	0.41* (6.25)	0.80* (5.51)	0.25* (3.04)	0.60	1.38
ΔEC	0.46* (2.81)	0.48* (6.25)	-	-0.52* (-2.93)	0.31* (3.29)	0.36	1.73
ΔWC	0.27* (3.77)	0.19* (5.51)	-0.10* (-2.93)	-	0.23* (5.80)	0.50	1.55
ΔSC	-0.02 (-0.13)	0.20* (3.04)	0.21* (3.29)	0.79* (5.80)	-	0.45	1.89

Notes: Coefficients marked * are significant at the 5% level, t-values are presented in brackets below regression coefficients. NC - Northern Croatia, CC - Central Croatia, EC - Eastern Croatia, WC - Western Croatia, SC - Southern Croatia. Source: Author's calculations.

According to the results, regions in Croatia may be divided into three groups:

1. A region where the correlation between labor market variations at the national level and at the regional level is significant - Central Croatia.
2. Regions where the correlation between variations at the national and the regional level is significant, but regional influences pertain - Western, Southern and Northern Croatia.
3. Regions with strongly visible regional specifics - Eastern Croatia.

In view of the above-mentioned limitations, the fact that Central Croatia shows the highest degree of correlation with national variations is not surprising. However, whether there are other arguments to support these results remains to be tested. The

¹⁰ Botrić (2003) also reports the results of other regression equations traditionally used in regional unemployment data analyses. Specifically, the OLS regressions with regional dependent and national independent variables, the OLS regressions with a dependent regional variable while independent variable is used for the rest of the country, and the method of instrumental variables (IV).

characteristics of the Croatian economy, in general, substantiate the results obtained, specifically by the following arguments:

1. The structure of the Croatian economy substantially differs between the regions thus defined. Agricultural production is most important in Eastern Croatia, the region with the most pronounced regional specifics. At the same time, regions characterized by traditional industrial production have a higher correlation with variations at the national level. Such results can be observed in other countries too. Thus Blanchard and Katz (1992), applying somewhat different estimation methodology on annual employment data, find that the U.S. regions with a high share of agricultural production in the 1948-1990 period exhibit a relatively high degree of independent movements, whilst regions dominated by traditional industry were much more correlated with movements at the national level.
2. The regional structure of the Croatian economy is also connected with a different regional propensity to officially register one's unemployment status. Since the transition economies on average have a higher share of the unofficial sector in comparison with the market economies, regional distribution of the unofficial sector could enable the comparison between the countries. The impact of the unofficial sector on regional indicators is also evident in the studies in other transition countries, particularly the studies addressing the early stages of transition.¹¹ However, the extent of such an impact is not easy to quantify. In general, there are economic activities in which unregistered employment is relatively common. Such activities in Croatia have different importance in the economic structure of individual regions. For example, tourism is most developed in Western and Southern Croatia, and exhibits a strong seasonal demand for labor; however this is not necessarily recorded in statistical data on employment or unemployment.
3. The war in Croatia has affected the ability to implement restructuring in certain regions. In the regions with substantial war damage economic activity was completely suspended for a prolonged period of time. As a consequence, labor market processes and company restructuring were postponed. That is why Eastern Croatian unemployment is so poorly correlated with the average Croatian unemployment movements. The war had another, more direct impact on the data series used in the analysis. Registration presents a specific problem

¹¹ *Gacs and Huber (2003).*

geographical diversity of Croatia, which produces larger diversity of economic structure among regions. Nonetheless, the characteristics of the VAR model applied, as well as of the data available, do not allow conclusions regarding an actual ranging of individual regions to be reached solely on the basis of such a specific model.

5 Conclusions

This paper presents empirical testing of the existing differences in the regional labor markets in Croatia. The results achieved are in line with our expectations, indicating that substantial differences between Croatian regions regarding unemployment do exist. Three groups of regions have been identified. Central Croatia shows the highest degree of correlation with the movements at the national level. As for the comparison with other countries, it has been established that regional impacts on the labor market in Croatia are much more pronounced than in some EU candidate countries.

As it is among the objectives of regional analyses to establish a need to introduce economic policy measures at the regional level, it needs to be noted that the analysis results obtained in this paper may not be used for this purpose for a number of reasons. One of the most important ones is that the regional structure presented here is no more than a proposal for a possible division that was drafted solely for statistical purposes, in other words for data collection and processing. Although the introduction of economic measures requires prior analytical estimates, and quality data sources, it is not necessary for the regions to be aggregated in the same manner for statistical and for regional policy purposes. Furthermore, despite public pressure to resolve specific local problems in the labor market, the literature does not advocate the necessity of imposing specific regional policy measures in the labor markets.¹³ Specifically, the unemployment rate is not always determined by a process of optimal resource allocation, but is very often influenced by the unemployment insurance system and the system of wage setting. Both systems have the potential to generate adverse externalities and may thus lead to the unemployment rates above an economically optimal level. A regional approach to the resolution of labor market problems, without adequate analytical background, may intensify adverse externalities. At the same time, the focus on a regional approach and regional research persists in all EU candidate countries,

¹³ *Layard, Nickell and Jackman (1991, p. 471).*

inter alia, because of access to EU structural funds. Since one of the EU goals is to achieve higher employment rates, it may be expected that labor market related regional analyses will in future be of particular interest. At present it is hard to offer any concrete recommendations as to whether and in what way to intervene by special measures at a regional level.

For regional labor market developments analysis to be improved, in addition to considering the differences in unemployment, other parameters such as employment variations, differences in wages and activity rates, and a number of others must be taken into accounts. A particular issue that may affect the speed of balancing unemployment rates between Croatian regions is the mobility of capital and labor force. In Croatia there is a tendency towards higher concentration of economic activities in some parts of the country; while labor force mobility remains relatively low. These events are certainly not related only to the economic factors. As the analytical apparatus does exist and has been presented in this paper, limited data sources are responsible for not being applied more thoroughly. Once other labor market segments are analyzed, it will be possible to understand regional labor markets in Croatia better and determine whether some action at the regional level needs to be taken.

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